

1 **NATIONAL TRANSPORTATION SAFETY BOARD**

2 Office of Marine Safety
3 Washington, D.C., 20594
4

5 August 31, 2007
6

7 **SURVIVAL FACTORS GROUP FACTUAL REPORT**
8

9 **DCA07MM015**

10 **A. ACCIDENT**
11

12 Vessel: M/V Empress Of The North
13 Date: May 14, 2007
14 Time: About 0130 Alaskan Daylight Savings Time
15 Location: 58° 10.6' N, 135° 03.1' W
16 Owner/Operator: Majestic Cruise Lines
17 Complement: 75 Crew, 206 Passengers
18
19

20 **B. SURVIVAL FACTORS GROUP**
21

22 Chairman: Liam J. LaRue, NTSB
23 Washington, DC
24
25 Paul Webb, USCG
26 Juneau, AK
27
28 Randy Burns, Majestic America Line
29 Seattle, WA/Portland, OR
30

31 **C. SUMMARY**
32

33 On Monday, May 14, 2007, at approximately 0130 local time, the 360-foot passenger vessel
34 *Empress of the North*, one of a fleet of seven vessels operated by Majestic America Line,
35 grounded on a charted rock as it negotiated a turn to the west out of Lynn Canal into Icy Strait,
36 about 20 miles southwest of Juneau, Alaska. The vessel had departed the port of Skagway at
37 approximately 1720 on May 13th, with 206 passengers and a crew of 75, southbound for Glacier
38 Bay. As the vessel made its way south in Lynn Canal it was progressing at its typical sea speed
39 of 12 knots. The trip south was uneventful as it neared the area where the mate would navigate

THIS IS A DRAFT-NOT A FINAL REPORT

1 the *Empress of the North* westward into Icy Strait, on its way to its next scheduled destination of
2 the 7-day cruise, Glacier Bay. As the mate navigated the vessel towards Icy Strait, the vessel
3 struck the charted, illuminated Rocky Island. The Coast Guard and several Good Samaritan
4 vessels assisted in evacuating the passengers and non-essential crewmembers, and safely
5 transporting them back to Juneau. No injuries resulted from the accident, but the vessel sustained
6 significant damage to its starboard underside and propulsion system.

7 8 **D. DETAILS OF THE INVESTIGATION**

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10 The Survival Factors Group convened in Juneau on May 15, 2007, at 0830. The group
11 documented the vessel's lifesaving equipment, interviewed pertinent deck, Coast Guard, City of
12 Juneau, and Good Samaritan vessel personnel. The survival group also examined pertinent
13 vessel and personnel records.

14 **INCIDENT COMMAND STRUCTURE**

15 The U.S. Coast Guard utilized the Incident Command System (ICS) as the response
16 structure for the *Empress of the North* mass rescue operation. While most emergency situations
17 are handled locally, a major incident often requires help from other jurisdictions, including the
18 state and federal government. ICS is a standardized, on-scene, all hazard incident management
19 concept, that allows for a consistent response to any type or size of emergency. Response plans
20 from the Coast Guard, City of Juneau, and the State of Alaska brought all affected parties
21 together to form a Unified Command. The Captain of the Port was Incident Commander,
22 overseeing the 4 main sections: Planning, Logistics, Operations, and Finance. The Operations
23 section was made up of an environmental branch, SAR branch, Emergency Medical Services
24 (EMS) branch, Security branch, and Investigations branch. State and local government
25 representatives, as well as personnel representing the responsible party also took part in the

command staff. A Unified Command structure allows all involved parties to work together to successfully respond to an incident while minimizing redundancy and increasing efficiency.

COAST GUARD RESPONSE

Coast Guard District 17 maintains control over search and rescue operations for the area where the grounding of the *Empress of the North* occurred. District 17 utilizes an Operations Plan for all search and rescue activities. Included in this Operations Plan is an appendix on response operations for major marine disasters or mass rescue operations events (Appendix 26 to Annex C to CGD17 OPLAN 9870-05). The appendix is based on a threat assessment for the area and risk assessments for different vessels operating in it. The worst-case scenario for the district, as described by the appendix, is “a grounding or fire on board a high capacity passenger vessel or large fish-processing vessel in a remote location that lacks a quick response infrastructure”.¹ The plan identified expected issues including the following: “A major concern with high capacity passenger vessels is with the disposition of the passengers, many of whom may be elderly, handicapped, injured or requiring special medical care. Local medical facilities will be quickly over whelmed. Accountability for all passengers and crew will be a priority.”² The appendix also contained an execution checklist, procedures for evacuee accountability, and a multi-agency cruise ship emergency quick start guide. The Coast Guard utilized this appendix in responding to the *Empress of the North* grounding.

The Coast Guard Communications Center, located at the District 17 Headquarters in Juneau, received the initial radio transmission from the *Empress of the North* at 0135 local time. The SAR case was immediately passed to the Command Center, which served as SAR Mission

¹ Appendix 26, p. 4, paragraph (1)

² Appendix 26, p. 4, paragraph (2)

Coordinator (SMC) for the event. The Communications Center is a separate room contained inside the Command Center that handles all communications activities.

Within minutes Air Station Sitka was contacted and briefed on the grounding. The Air Station had two available helicopters that were prepared to launch. The Communications Center issued an urgent marine information broadcast (UMIB) over VHF radio, alerting vessels in the area of the emergency situation. At 0145 CGC Liberty, a 110-foot patrol boat in Bravo 2 status,³ was tasked with responding to the incident. The Chief of Response for the 17th District was called in to the command center and began to oversee SAR operations. He immediately confirmed that the Initial Mass Rescue Operation Checklist was being followed.

The Chief of Response indicated to investigators that one of the first things he did was contact the Marine Exchange of Alaska⁴ to find out what vessels were operating in the vicinity of the accident. The Marine Exchange runs a secure vessel tracking system that uses satellite and AIS transponders to track vessels in Alaska. The Marine Exchange provided the Coast Guard names of AIS equipped vessels that were nearby, as well as a copy of the AIS playback of the grounding.

In conjunction with the UMIB, the Chief of Response instructed the Communications Center to call out over VHF to those specific vessels identified by the Marine Exchange and to request assistance. He told investigators that “We did an Urgent Marine Information Broadcast, our UMIB, which is just a shotgun broadcast that’s saying that there’s an urgent matter out there and anybody that can assist, please respond and assist. But I also wanted to make specific

³ Bravo 2 is a standby status that indicates a vessel must be ready to get underway within 2 hours.

⁴ MEX Alaska is a non-profit organization, established in 2000, to bring the diverse Alaska maritime community together with the common goal of providing information, communications, and services that help ensure safe, secure, efficient and environmentally responsible maritime operations.

1 callouts because sometimes people kind of blank it out, if you're not really listening, but when
2 you hear your name being specifically hailed, people respond to that."

3 Two HH-60 Jayhawk helicopters were launched from Air Station Sitka; CG 6024 took
4 off at 0230, and CG 6002 was airborne at 0245. Station Juneau launched a 47-foot motor
5 lifeboat (CG 47261) at 0233. Prior to these assets arriving on scene the Communications Center
6 maintained its picture of the emergency situation through radio updates from the *Empress*, as
7 well as status reports from Good Samaritan vessels as they responded to the UMIB.

8 At 0315 the first air asset, CG 6024, arrived at Icy Straight and assumed the role of On-
9 Scene Commander. According to the Chief of Response, the aircraft's job was to make sure
10 everyone was evacuated safely, and to keep track of the ships that passengers were being
11 evacuated onto. As passengers were transferred off of the *Empress* and onto other vessels, the
12 aircraft received lists of their names by radio, which it passed back to the Command Center.
13 This aircraft oversaw the response until *CGC Liberty* arrived at 0405. The second Jayhawk (CG
14 6002) from Sitka arrived on scene at 0318. Two other aircraft; a Jayhawk from Cordova and a
15 C-130 from Kodiak, were launched but then called back when it was established that the two
16 Jayhawk helicopters provided sufficient air resources on scene. A third helicopter was later
17 launched from Air Station Sitka as a relief for those on scene. There was at least one Coast
18 Guard air asset present throughout the entire evacuation. A 25-foot response boat (CG 25446)
19 was launched from Station Juneau at 0722 to provide a relief crew for the 47-footer on scene.
20 The 25-footer eventually escorted the *Empress of the North* back into port.

21 As SAR Mission Coordinator, the Command Center monitored the transfer of passengers
22 onto other vessels, ensured that 100 % accountability was accomplished, and provided necessary

assets to the response as needed. Their active role continued until passengers were returned safely to Juneau.

ON-SCENE EMERGENCY RESPONSE

The Master, who had been sleeping when the grounding occurred, arrived on the bridge seconds after the vessel struck Rocky Island. He immediately assessed the situation and took control. His first action was to make an announcement to the crew berthing areas at 0132, instructing them to get up, get dressed, and make their way to the main deck. He then made several emergency calls on the VHF radio, channel 16. He quickly made contact with the Coast Guard in Juneau and described the emergency and location of the vessel.

After giving the crew enough time to get into position, he began making announcements to the passengers. At 0142, he announced that there was an emergency situation and that they needed to wake up. Shortly thereafter, he instructed passengers to report to their muster stations with their PFDs. He asked passengers to remain calm, and assured them that the vessel was stable. He continued to make announcements to keep them informed of evacuation plans throughout the event. After passengers had mustered, crewmembers went through all cabins to ensure that they were clear. A mark was made on the outside of each cabin door to indicate that it had been searched and found to be empty.

The Master became aware that the hull had been breached as a result of the grounding because the vessel began slowly listing to starboard. He ordered the chief engineer and other crew to check below deck spaces for signs of flooding. Because there was no flooding on the interior of the vessel, he believed that he had holed an under deck void that stretched across the beam of the ship, and that as it filled with water the vessel would level out. The engineers continued to monitor below deck spaces for signs of flooding throughout the evacuation.

1 The Master utilized two emergency procedures checklists when responding to the
2 grounding. He completed a flooding checklist, as well an abandon ship – underway checklist.
3 Both checklists came from the vessel’s Emergency Response Checklists binder. Written
4 emergency procedures are required by ISM code to be part of any safety management system.⁵
5 The Emergency Response Checklists binder was kept on the bridge and readily accessible.
6 Copies of the completed checklists were provided to Safety Board investigators.

7 Although confident in the seaworthiness of the vessel, the Master decided to launch life
8 rafts as a precaution. He informed investigators that his plan was to launch life rafts on the port
9 side, because they were listing to starboard. He said, however, that he did not want to have to
10 resort to the life rafts because of the large number of elderly passengers on board. Because
11 numerous vessels that were in the area offered to assist, he indicated that he considered the life
12 rafts a “last resort,” but ensured the crew continued to launch them. Notes from the purser
13 logging events on the bridge indicated that 10 rafts were launched on the port side and two rafts
14 from the starboard side at around 0224. Examination of the lifesaving equipment by
15 investigators post-accident revealed that 8 life rafts were launched from the port side, along with
16 the inflatable buoyant apparatus (IBA) for that side. Four rafts were launched from the starboard
17 side. Two inflatable evacuation slides were deployed, both on the port side of the vessel.

18 The Master made contact with several vessels in the area including the fishing vessel
19 *Evening Star*, fishing vessel *Willow*, small passenger vessel *Spirit of Columbia*, and the towing
20 vessel *Tiger*, which was towing a fuel barge. These vessels all indicated they were willing to
21 assist in evacuating passengers from the stricken cruise ship. The two fishing vessels were the
22 closest, and therefore, the first to assist. The *Evening Star*, a 56-foot commercial fishing vessel,
23 came alongside the starboard side of the *Empress* at 0223 local time and began taking passengers

⁵ ISM Code, part A, 1.4.5 (page 7)

1 on board. At 0239 the *Evening Star* departed with 33 persons (30 passengers and 3 crew) from
2 the *Empress*. The *Willow*, a 32-foot long liner, came alongside at 0251, also on the starboard
3 side. The *Willow* accepted 14 persons (13 passengers and 1 crew) and was away at 0308,
4 according to notes taken on the bridge.

5 The *Spirit of Columbia*, a Coast Guard inspected small passenger vessel (subchapter K),
6 was the next vessel to assist. According to its Captain, the *Spirit of Columbia* tied up on the port
7 side of the *Empress* at 0329. The vessel took on 52 persons, including 4 in wheelchairs and 5
8 needing assistance to walk, before getting back underway at 0424.

9 Meanwhile, the towing vessel *Tiger* arrived on scene. Before taking on passengers, *Tiger*
10 first tied up alongside the fuel barge it was towing. Next, the *Evening Star* and *Willow* both
11 transferred all of their rescued passengers and crew over to the *Tiger*. After receiving 47 persons
12 from the two fishing vessels, *Tiger* tied up on the starboard side of the *Empress* with its barge
13 next to the vessel at around 0415. The *Tiger* took only 22 additional passengers on board but
14 remained alongside until 0519, standing by because it had space to house more passengers if
15 needed. Shortly after getting back underway, 4 additional crewmembers were transferred to the
16 *Tiger* by the Coast Guard 47-footer, which arrived while they were still alongside. These 4
17 crewmembers were the last non-essential crew to leave the *Empress*, and gave the tug a total
18 count of 73 passengers and crew on board.

19 Coast Guard Cutter *Liberty*, a 110-foot patrol boat, was the final vessel to take part in the
20 passenger evacuation. It arrived on scene at 0405 and assumed on-scene command. At 0438,
21 the *Liberty* tied up on the port side of the *Empress* and began taking on passengers and non-
22 essential crew. It received a total of 127 persons on board. All passengers were reported to be
23 off of the *Empress* by 0456. Prior to casting off, the CO of the *Liberty* visited the bridge on the

1 *Empress of the North*. The Executive Officer on the *Liberty* told investigators that the CO went
2 on board to assess the state of the Master. The CO returned to the *Liberty* and told his Executive
3 Officer that the Master seemed to be sober, aware of his surroundings, and handling the stress
4 well. When the *Liberty* got back underway at 0521, there were 29 crewmembers left on board
5 the *Empress*. All passengers and crew that evacuated from the *Empress* were wearing life
6 jackets.

7 During the passenger evacuation, the engineers on board the *Empress* reported flooding
8 through bulkhead penetrations in crew spaces. They had 4 bilge pumps working and the Chief
9 Engineer requested to use the fire main to help pump water out. The Captain agreed, and with all
10 pumps running they managed to decrease the flooding to around 25 gallons per minute as they
11 finished evacuating passengers. The Captain decided that because the flooding was at a
12 manageable rate they would attempt to return to port with the vessel under its own power. Once
13 all passengers were off they began heading to Auke Bay, departing the scene around 0600. The
14 Alaska Marine Highway System (AMHS) pier was made available for their use. When they
15 departed, all passengers and non-essential crew (252 persons) were located on board either the
16 *Tiger*, *Spirit of Columbia*, or CGC *Liberty*. Only 29 crewmembers remained on board the
17 *Empress of the North*.

18 The M/V *Columbia*, a 418-foot long ferry vessel for the AMHS, responded to the Coast
19 Guard's UMIB and arrived on scene at around 0554. The *Columbia* was on a normally
20 scheduled ferry run en route to Juneau when it received the call from the Coast Guard and
21 diverted to assist. The Coast Guard decided to transfer all evacuated passengers and crew onto
22 the *Columbia* because as the CG Chief of Response told investigators, "it was a much better
23 platform that could house everybody. Like I said, we wanted to make sure we had total

1 accountability. We didn't like having people all spread out all over the place. So we moved
2 them."

3 The *Liberty* went alongside the *Columbia* and tied up at 0625. They made fast alongside
4 an access to the ferry's car deck on the port side because the opening aligned well with their
5 main deck. They transferred all 127 passengers and crew onto the *Columbia*. Because the decks
6 lined up well between the two vessels, the *Liberty* remained alongside the *Columbia*. The Coast
7 Guard 47-foot motor lifeboat (CG 47261) was used to ferry passengers from the Good Samaritan
8 vessels to the *Columbia*, by way of the *Liberty*.

9 At 0642, CG 47261 went alongside tug *Tiger* and received 36 passengers. After dropping
10 those off onto the *Liberty*, CG47261 returned to the *Tiger* at 0712 and retrieved the remaining 37
11 passengers on board. Minutes later the motor lifeboat dropped those passengers off onto the
12 *Liberty*. The 47-footer next tied up alongside the *Spirit of Columbia* at 0738. After receiving 25
13 passengers they ferried them over to the *Liberty*, beginning to transfer them at 0752. CG 47261
14 was back alongside the *Spirit of Columbia* at 0823 and loaded the remaining 27 passengers on
15 board. At 0834, CGC47261 tied up alongside the *Liberty* and offloaded those last 27 passengers.

16 A timeline provided by the Master of the *Columbia* indicated that the transfer of all
17 *Empress of the North* passengers and crew was completed at 0840, and that 252 persons were
18 taken on board. It took around two and a half hours to transfer all passengers onto the ferry.
19 After ensuring that all passengers made it to the *Columbia* safely, the *Liberty* got underway from
20 the vessel at 0855. The Coast Guard conducted a final accountability once all passengers were
21 on board the *Columbia*, prior to allowing the vessel to depart for Juneau. The *Columbia* left the
22 scene shortly after 0900, and arrived at Auke Bay at around 1100.

23 **SHORE SIDE EMERGENCY RESPONSE**

24

1 During the rescue operations, the Coast Guard coordinated closely with the City of
2 Juneau. Upon notification of the accident, the City put its plan for a cruise ship disaster into
3 action. Juneau's Cruise Ship Shore-side Response Plan identifies and assigns departments and
4 agencies various responsibilities and tasks for emergency and disaster response operations.⁶ The
5 plan uses the Incident Command System/Unified Command concept of operations. The City of
6 Juneau takes part in annual drills to practice their response plan. The last drill conducted took
7 place in Anchorage on January 22 and 23, 2007.

8 An Emergency Operations Center (EOC) was set up at the Juneau Police Station and
9 staffed by designated personnel including the Port Manager for Juneau, Fire Department
10 personnel, and the USCG. The Duty Officer for Capital City Fire and Rescue was the first to
11 arrive at the EOC. He was followed by the City Emergency Coordinator, a Coast Guard
12 representative, and a representative from the AMHS. The EOC assisted in obtaining an accurate
13 passenger manifest, and prepared to receive the large number of passengers off of the *Empress of*
14 *the North* when they were brought to Juneau. Ambulances were requested and waiting for the
15 AMHS Ferry *Columbia* when it arrived with the rescued passengers. Buses were arranged and
16 were waiting to transport passengers to a reception facility that had been designated for the
17 incident at Centennial Hall Convention Center, located approximately 12 miles away in
18 downtown Juneau. Food, blankets, cots, and shelter were provided to all passengers at
19 Centennial Hall until transportation was arranged to send each person home. All passengers
20 were accounted for one final time upon arrival at Centennial Hall.

21 22 **INJURIES** 23

⁶ CBJ App B – Cruise ship Response final1, p. B-5, paragraph C

The injuries sustained in the *Empress of the North* accident, shown in table 1, are categorized according to the injury criteria of the International Civil Aviation Organization (ICAO). The Safety Board uses the ICAO injury criteria in all its accident reports, regardless of transportation mode.

Table 1. Injuries sustained in *Empress of the North* accident.

Type of Injury	Crew	Passengers	Total
Fatal	0	0	0
Serious	0	0	0
Minor	0	0	0
None	75	206	281
Title 49 CFR section 830.2 defines a fatal injury as any injury that results in death within 30 days of an accident. It defines serious injury as that which requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; results in a fracture of any bone (except simple fractures of fingers, toes, or nose); causes severe hemorrhages, nerve, muscle, or tendon damage; involves any internal organ; or involves second- or third- degree burns, or any burn affecting more than 5 percent of the body surface.			

There were no injuries resulting from the grounding or evacuation. According to an incident report from the Capital City Fire/rescue Duty Officer on watch at the time of the accident, 2 *Empress of the North* passengers were transported to the hospital by ambulance because of medical complaints not directly related to the accident. One individual was taken upon arrival in Auke Bay, while the other was taken later from Centennial Hall. One other *Empress of the North* passenger requested medical evaluation but refused any treatment or transport.

LIFESAVING EQUIPMENT

The *Empress of the North* was required to by regulation to carry approved lifesaving equipment as specified on its Coast Guard issued Certificate of Inspection (COI). The *Empress*

1 carried inflatable life rafts⁷, inflatable buoyant apparatus, and life rings. Personal flotation
2 devices (PFDs) were provided for all passengers and crew. The vessel also had on board
3 inflatable marine evacuation slides designed for use with approved lifesaving equipment.

4 The *Empress* carried twenty 50-man inflatable life rafts, kept along the main outer deck.
5 Ten life rafts were stowed on each side of the vessel in overhead cradles. Two inflatable buoyant
6 apparatus were also kept on board. The buoyant apparatus were stowed in containers similar to
7 the life rafts, only slightly smaller. They were stowed in the overhead on the main deck amongst
8 the life rafts, just forward of the main doorway amidships. There was one buoyant apparatus on
9 each side of the vessel. Buoyant apparatus are used to create a platform for passengers to slide
10 down onto from the vessel. Passengers would then enter the life rafts from the platform. The
11 buoyant apparatus provide a similar sized floating surface as a life raft, but without the protection
12 of a canopy.

13 Shortly after the vessel grounded, the master decided to launch life rafts on the port side.
14 Each life raft had two release units, manufactured by Hammar, that would release the raft from
15 its cradle by one of two methods: one designed for automatic launching in the event of the
16 vessel's sinking, and the other for manual launching. Automatic launching of the liferafts would
17 be accomplished by a unit that, when submerged to a predetermined depth, would sever the line
18 securing the raft. Manually releasing a life raft required the use of a hand pump, a Hammar
19 model H20 remote-release unit (RRU), located on the vessel bulkhead, next to the rafts.
20 Activating the pump would sever the line, freeing the life raft from its cradle and allowing it to
21 drop into the water alongside the vessel.

⁷ The vessel had a SOLAS exemption that allowed them to substitute inflatable life rafts for required lifeboats. A typical passenger vessel of *Empress of the North's* size would be required to have lifeboats on each side of the vessel capable of carrying 37.5% of the total number of persons on board in addition to life rafts. (46 CFR Part 199.201 (b)(i))

1 A placard posted below each pump stated that to deploy the rafts, “Pump plunger two to
2 six times until the raft releases.” According to the manufacturer, pumping the plunger would
3 create sufficient vacuum to activate the RRU, releasing the knife that would cut the rope securing
4 the life raft to the vessel. However, the Chief Mate told Safety Board investigators that the hand
5 pumps failed to activate about half the mechanisms in the 13 rafts (12 life rafts and one IBA) that
6 were launched. He indicated that the plungers were pumped “upwards of a dozen to two dozen
7 times”, yet did not activate the hydrostatic release unit. Crewmembers were forced to cut the
8 lines using their own knives to launch the life rafts. Evidence provided by the vessel operator
9 indicates that the pumps connected to the hydrostatic release units had not been lubricated as
10 directed by the manufacturer. The Master told investigators that he did not like the pumps
11 because they “slowed [the Chief Mate] down” as he attempted to launch the rafts. The Safety
12 Board issued the following recommendation to the U.S. Coast Guard after discovering that many
13 of the manual release mechanisms for the life rafts did not activate:

- 14 • Verify the functionality of Hammar model H20 remote-release units for liferafts
15 by inspecting or delegating the inspection of a sample of the models, requiring
16 authorized facilities to demonstrate functionality, or other equally effective
17 method. (M-07-09) Urgent

18 Per regulation, life rafts and inflatable buoyant apparatus are required to be serviced
19 annually⁸. Pacific Marine Distributors in Portland, Oregon serviced all the life rafts and IBAs on
20 board the *Empress* over a period from January 05 through January 18, 2007. The hydrostatic
21 release units on board the *Empress* were of a disposable type, to be replaced after two years of
22 use. All hydrostatic release units on board the *Empress* had expiration dates of February 2009.

⁸ 46 CFR 199.190 (g)(i),(ii)

1 The two evacuation slides carried on board were not required lifesaving equipment for
2 the *Empress*, however, by regulation, if this type of equipment is kept on board it must be
3 approved and functional. Evacuation slides enable low freeboard vessels to be evacuated
4 without passengers being required to jump either into the water or directly onto the platform.
5 The Coast Guard approved the two slides carried on board the *Empress* for use on the vessel.
6 The rafts were tested on board the vessel during plan review oversight by Coast Guard inspectors
7 in Seattle. The two slides were packed in fabric valises and stored separately from the life rafts
8 in a safety hold locker on the starboard side main deck.

9 Directional arrows were stenciled on the outside of the valises indicating the proper
10 installation arrangement for each slide. Arrows indicated which end should face inboard, which
11 end should face outboard, and where the pull-cord to inflate the slide was located. The stenciled
12 instructions were only present on one side of the bag, the side that would be facing upward when
13 properly positioned. The Chief Mate told investigators that the slides were often brought out
14 during drills and installed in their launching position for practice.

15 Crewmembers who attempted to launch the first slide found that it inflated in an inverted
16 position. As a result of its position, the slide inflated upwards and back against the skin of the
17 ship, effectively blocking the embarkation area. Unable to flip the slide into the correct position
18 because the tethering lines were extremely taught, they cut the slide loose and move it out of the
19 way. Crew brought out the second valise and installed it on the deck at the embarkation station.
20 The Chief Mate indicated that all personnel in the vicinity verified that the arrows stenciled on
21 the valise were pointing in the correct directions and that all believed the slide was installed
22 properly. The second slide then inflated in the same manner as the first, inverted and blocking
23 the exit.

1 The slides on board the *Empress* were intended to quickly evacuate passengers and crew
2 from the vessel to a buoyant apparatus, from which they would be able to more easily enter the
3 life rafts. Because the slides were upside down, crewmembers had to cut them loose and
4 manually turn them over. Several crewmembers were required to overturn the slides to their
5 correct positions and secure them to the vessel, wasting valuable time.

6 The Chief Mate told investigators that after the first slide launched improperly he said,
7 “wow, maybe something was done incorrectly...We put the second one in, with all those that
8 were standing there with me, I confirmed with everyone so that everyone could see that it was
9 indeed put in the proper direction. It decided to inflate incorrectly, also.” The Chief Mate
10 estimated that they spent approximately 10 to 15 minutes per slide trying to get them into the
11 proper position.

12 The SL32 model slides on board the *Empress* were both manufactured in December of
13 2002 by DBC Marine Safety Systems Ltd. of Richmond (Vancouver), British Columbia. The
14 slides were approved by the Coast Guard for use on ships with up to 3 meters of freeboard.
15 Lifesaving equipment of this type requires annual servicing to maintain Coast Guard approval.
16 Marine Safety Services (MSS) in Seattle, Washington, last serviced both slides on February 05,
17 2007.

18 Annual servicing involves inflating the slides, inspecting them, and repacking them.
19 Every five years a gas inflation test must be completed. The two slides on the *Empress* were last
20 Gas Inflated in August 2003, and March 2004, respectively. The inspection and repacking of the
21 slides can be carried out only by a facility approved by the U.S. Coast Guard, and MSS was
22 authorized to perform such inspections. Also, the individual servicing the slides must have

1 current certification from the manufacturer. Certification is received by attending a training
2 course for the servicing, maintenance, repair, and control of DBC products.

3 Inspection of the two SL32 slides was conducted by a DBC certified servicing technician
4 at MSS. His most recent training course was completed on May 1, 2007. His last certification
5 course prior to that was on September 17, 2004. Marine Safety Services had an approved, up to
6 date service manual on hand at their facility, which was made available for review by Safety
7 Board investigators. The manual was last updated in 2006, and contained specific packing
8 instructions for the SL40 slide, which is similar to the SL32.

9 When asked if the packing instructions were used each time a slide was serviced, the
10 technician told investigators that he would usually only break out the manual if he encountered a
11 problem with the packing or maintenance, especially for this type of slide, for which felt the
12 packing procedure was very straightforward.

13 DBC issued two service bulletins in July 2007 that affected the SL32 model slide carried
14 on board the *Empress of the North*. Service Bulletin DBC-07-04, issued on July 12, instructed
15 that all slide valises should be marked with the labels “THIS SIDE UP” on the top side of the
16 valise, and “TURN OVER” on the bottom side, at the next servicing. Service Bulletin DBC-07-
17 06 gave new instructions on the packing of the SL32 slide as follows:

18 “This service bulletin outlines how the SL32 shall be packed. It differs slightly from the
19 SL40 instructions because the cylinder is in a different position, this method allows for the
20 cylinder to be packed at the back of the valise so that when it is carried the cylinder does not
21 shift. The SL25 shall be packed similar to the SL40 because its cylinder is in a similar position
22 to the SL40.”

1 The Safety Board issued the following recommendation to the U.S. Coast Guard regarding the
2 inflatable evacuation slides:

- 3 • Conduct a one-time inspection and correction of all deficiencies of evacuation
4 slides last serviced by Marine Safety Services of Seattle, Washington. (M-07-10)

5 Urgent

6 The Coast Guard's response to this urgent recommendation stated the following:

7 "Based on interviews with the servicing personnel and a review of the packing
8 procedures, we determined that it would be extremely difficult to pack the slides
9 incorrectly without making significant modifications to the valise. The pull cord
10 especially must be oriented correctly inside the valise in order for it to be accessible
11 at the flap. Any incorrect folding or orientation would likely make the slide
12 impossible to deploy in any direction. We conclude that there were no deficiencies in
13 the evacuation slide servicing by Marine Safety Services. It is likely that
14 crewmembers, dealing with the stressful circumstances associated with the
15 grounding, placed the valises upside down on the deck, leading to the slides
16 deploying incorrectly."

17 **LIFESAVING EQUIPMENT TESTING**

18 After receiving the Coast Guard's response to Urgent Recommendation M-07-10,
19 investigators felt it was important to visit the Marine Safety Services facility in Seattle, as
20 well as the manufacturer's facility in Canada to get a better understanding of the
21 lifesaving equipment in question.

22 Marine Safety Services is a small, family operated business. There are two
23 employees, one of whom does all of the servicing, packing, and maintenance.

1 Investigators spoke with the two employees at length regarding packing procedures for
2 the evacuation slides, and viewed their service manual. The two slides from the *Empress*
3 of the *North* are the only two slides of that type serviced by MSS.

4 Investigators also visited DBC Marine Safety Systems' facility in Vancouver,
5 Canada to observe evacuation slide packing procedures and to observe the gas inflation
6 of a slide. Testing was conducted using a SL25 model slide, a smaller slide than the
7 SL32 carried on board the *Empress*. Other than size and cylinder positions, the slides
8 were nearly identical. A SL25 slide was used for testing because DBC did not have a
9 SL32 slide available. The SL25 was packed into a SL32 valise resulting in a slightly
10 looser fit than would have been observed had the SL32 been packed into it. Engineers
11 from DBC told investigators that they did not believe this would have any effect on how
12 the slide actually inflated.

13 Investigators first observed how the slide should be packed into the valise. The
14 valise was placed on the deck in an open position. The handle for the inflation pull cord
15 was placed through its designated hole in the valise and into position under the exterior
16 flap. The line attached to the pull cord was laid out to the side so that it could be
17 connected to the firing pin as the final step. The deflated slide was then placed onto the
18 valise; over what would be the bottom half of the valise. The securing lines were laid out
19 on either side of the slide. Securing lines are normally 6 inches in length including a
20 karabiner. The slide was then folded back onto itself several times until it formed a stack
21 over the bottom part of the valise. The top half of the valise was then folded over top of
22 the slide and secured to the bottom by a Velcro strap along the edges of the valise. The
23 last step was to connect the line from the inflation handle to the firing device for the

inflation cylinder. Once packed in the valise, the slide could be carried using the two handles, similar to a duffel bag.

DBC engineers and Safety Board investigators agreed on three possible configurations for slide installation that might result in a slide being inverted:

1. The slide folded and packed correctly into the valise, but the valise installed upside down on the deck. In this position, the stenciled instructions and pull cord flap would be underneath the slide.
2. The slide being folded and packed correctly, with the valise reversed. In this configuration, the slide would have to be placed on the top half of the valise instead of the bottom prior to folding. In effect, the slide would be flipped upside down in the valise.
3. The slide folded and packed correctly into the valise, but the valise installed backwards on the deck. In this position, the instructional arrows stenciled on the valise would be pointing in the wrong directions. The outboard arrow would be pointing inboard, and vice versa.

Investigators first observed the slide placed on the deck in the upside down position (number 1 above). In this position, the stenciled instructions were not visible because they were facing the floor. The flap with the inflation pull cord also was not visible as it was under the valise in this position. To reach the pull cord, investigators had to lift the valise on the side that contained the 66 pound CO₂/N₂ inflation bottle for the slide.

Investigators next observed the slide folded and packed with the valise reversed (number 2 above). When laid out open on deck, there are no marks or other identifiers to indicate which side of the valise the slide should be packed on. The slide was folded as

per the servicing manual, but on the top half of the valise instead of the bottom. There was no visual difference between this packing configuration and the slide packed correctly. The slide fit easily in the valise, and the securing lines and pull cord were accessible without any type of modification to the valise. Although the outward appearance of the valise in this configuration was no different than the correct packing, when placed on deck with stenciled instructions facing up, as they should be, the slide was actually upside down in the valise.

The valise was then placed in position on a testing platform at the facility, approximately 3 meters in height. The valise was secured to eyebolts on the platform similar to how it would have been tied down on the vessel. The positioning of the bag was in accordance with the stenciled arrows on the bag (The outboard arrow pointing outboard, over the edge of the platform). Karabiners were not used in any of the tests conducted; instead, the securing lines were tied off to the eyebolts. Because DBC was unsure how the slide would actually inflate in this packed configuration, they requested that one of the securing lines not be tied off for this test. The line on the right side, facing outboard, was put through the eyebolt and held by a DBC employee. It was allowed to pull free to prevent damaging the slide. When the inflation cord was pulled, the slide inflated outboard in an inverted position.

The slide was then deflated using a vacuum and repacked into the valise as per manufacturer instructions. For the second inflation test, the slide was secured to the testing platform backwards, so that the outboard arrow was pointing in the inboard direction (number 3 above). In order to avoid excessive wear on the slide, the next inflation was conducted using compressed air. The slide's securing lines were tied off on

both sides to the eyebolts. Using compressed air resulted in a longer inflation time for the slide. When the air inflation began, the slide popped out of the valise and fell outboard, off the platform as it inflated. The securing lines held it in position so that it actually inflated upward and folded back against the platform, or what would have been the skin of the ship. The slide ended up in an inverted position, with its bottom facing inboard.

In order to confirm that this was not a result of the slower compressed air inflation, DBC agreed to allow a second gas inflation test on the slide. The slide was deflated and packed back into the valise as per manufacturer instructions with a new CO₂ charge. The valise was secured on the testing platform backwards, with the outboard arrow pointing inboard. The slide was gas inflated in this position, with the same result as the air inflation. As the slide began to inflate, it was forced outboard and off of the platform. The slide was inverted, and because of its position off of the platform it inflated upwards and back towards the platform.

DBC created two diagrams representing different post-inflation positions for the evacuation slide. The diagrams were sent to the Chief Mate to identify which position best matched the position of the slides on the *Empress*. The Chief Mate picked the slide position where the slide was inverted, and folded back up against the skin of the ship, blocking the embarkation area.

PILOTAGE REQUIREMENTS

The Certificate of Inspection for the *Empress of the North* contained the following endorsement regarding pilotage:

“When not sailing on register and operating upon the navigable waters of the united states, all deck officers shall meet the requirements as first class pilot of inspected vessels of at least 1600

1 gross registered tons (GRT) on both designated and non-designated pilotage waters in
2 accordance with 46 CFR 15.812(b) and (c); and Table 15.812(e)(1).”

3
4 The Empress of the North was operating in designated pilotage waters, as determined by the
5 OCMI, when it grounded. Per the regulations, the Empress of the North was required to be
6 operated by a Federal Pilot when transiting through those particular waters. According to Coast
7 Guard Navigation Inspection Circular (NVIC) 08-94, there are two types of individuals who may
8 serve as a pilot. One is an individual holding a Federal first class pilot’s license with
9 endorsement for the route, in accordance with 46 CFR 15.812(b)(1). The other individual who
10 may serve as a pilot is generally referred to as an “acting as” pilot. An “acting as” pilot is an
11 individual who is a licensed member of the vessel’s crew and who also satisfies the qualification
12 requirements found at 46 CFR 15.812(b)(2) and (b)(3) as follows:

- 13 1. Must be at least 21 years old
- 14 2. Must maintain a current knowledge of the waters to be navigated (One round trip within
15 the past 60 months).
- 16 3. Must have 4 round trips of the route. If the route is to be traversed during darkness, 1 of
17 the 4 round trips must be made during darkness.

18 NVIC 08-94 states that “acting as” pilots must complete a specified number of round trips over
19 the route to be traversed. These individuals self-certify as to their qualifications for a route, i.e.,
20 they are not issued a pilot’s license or endorsement that describes the specific waters upon which
21 they are authorized to serve as a pilot. A description of the route requirements for a licensed first
22 class pilot and an “acting as” pilot may be obtained from the Officer in Charge of Marine
23 Inspection (OCMI) concerned. It is incumbent upon the mariner who will “act as” a pilot to
24 determine in advance whether he/she meets the local pilotage requirements. For the purposes of
25 establishing the requisite number of round trips in a given pilotage route segment, the local

knowledge requirements may be satisfied when the licensed individual has transited the length of the segment or, if the local pilotage requirements permit, has made trips to one or more facilities within the segment.

The third mate on watch at the time of the grounding did not hold a Federal first class pilot's license or meet the requirements for an "acting as" pilot. The third mate did not have current knowledge of the waters and had not been on any round trips on the route in daylight or darkness.

DRUG AND ALCOHOL TESTING

Drug and alcohol testing was conducted on board the *Empress of the North* for 8 crewmembers, including the Master and all watchstanding personnel. Drug and alcohol tests were conducted on the vessel between the times of 0550 and 0717 on 14 May. Alcohol testing was conducted using a breath device. All results were negative (.000 scores). Drug tests were conducted using urine specimens. Specimens were tested for the big 5 drugs: THC (marijuana), cocaine, PCP, opiates, and amphetamines. All drug tests were negative.

Alcohol testing is required by regulation to be completed within 2 hours after a serious marine incident. However, alcohol testing can still be conducted up to 8 hours following an accident if a crew is actively engaged in responding to an emergency or ensuring the safety of the vessel. Personnel on board the *Empress* were actively involved in responding to the emergency for several hours. Alcohol tests were conducted on crewmembers within the 8-hour testing limit. Drug testing is required by regulation to be conducted within 32 hours of a serious marine incident. All drug tests were conducted on board the *Empress* in less than 6 hours.

Liam LaRue